## CLAIMS

1. Apparatus for assaying an analyte in blood in a patient's blood vessel comprising:

a light provider comprising at least one light source that illuminates a tissue region in which a blood vessel is located with light that stimulates photoacoustic waves in the region;

at least one acoustic transducer that generates signals responsive to the photoacoustic waves;

a controller that receives the signals and processes them to determine which are responsive to photoacoustic waves that originate in the blood vessel and uses the determined signals to assay the analyte; wherein,

the light provider and at least one transducer define a field of view that overlaps the blood vessel, said field of view having a central region and a lateral extent greater than about 4 mm.

2. Apparatus according to claim 1 wherein the field of view has a lateral extent greater than or equal to about 6 mm.

3. Apparatus according to claim 1 wherein the field of view has a lateral extent greater than or equal to about 10 mm.

4. Apparatus according to any of claims 1-3 wherein the light provider comprises optics for each of the at least one light source that receives light from the light source and configures the received light into a fan shaped light beam that is used to illuminate the tissue region.

5. Apparatus according to claim 4 wherein the at least one light source comprises a plurality of light sources.

6. Apparatus according to claim 5 wherein the fan beams of the plurality of light sources are substantially parallel.

7. Apparatus according to claim 6 wherein the plurality of light sources are collinear.

8. Apparatus according to claim 6 wherein the plurality of light sources are configured in an array of rows and columns.

9. Apparatus according to any of claims 1-8 wherein the light provider comprises a mirror that receives light from the light source and reflects the received light to the tissue region and wherein the mirror is rotatable about an axis and for different rotation angles of the mirror about the axis the fan beam illuminates a different portion of the tissue region.

10. Apparatus according to claim 9 and comprising a controller that controls the angle of the mirror to scan the tissue region with light from the light source.

11. Apparatus according to any of the preceding claims wherein the light provider comprises a light pipe having an input surface region to which at least one light source is coupled and an output surface region through which light that enters the light pipe from the at least one light source exits the light pipe.

12. Apparatus according to claim 11 wherein the light pipe has a shape of a planar plate having two large parallel face surfaces and narrow edge surfaces.

13. Apparatus according to claim 12 wherein the input surface region to which the at least one light source is coupled is a narrow edge surface of the light pipe.

14. Apparatus according to claim 13 wherein the output surface region from which light exits the light pipe is a narrow edge surface opposite the input surface region.

15. Apparatus according to any of the preceding claims wherein the at least one transducer comprises a plurality of transducers.

16. Apparatus according to claim 15 wherein the transducers are configured in an array of rows and columns of transducers.

17. Apparatus according to claim 15 or claim 16 and comprising a mounting plate, which is attached to the skin to acoustically couple the apparatus to the skin.

18. Apparatus according to claim 17 and wherein the transducers are mounted to the mounting plate.

19. Apparatus according to claim 17 wherein the mounting plate comprises a layer of piezoelectric material.

20. Apparatus according to claim 19 wherein each of at least two of the plurality of transducers comprises a different region of the layer of piezoelectric material sandwiched between a first and a second electrode.

21. Apparatus according to claim 20 wherein the first electrodes of each of the at least two transducers are substantially electrically isolated from each other.

22. Apparatus according to claim 21 wherein the second electrode of each of the at least two transducers comprises a different region of a same conductor.

23. Apparatus according to any of claims 1-22 wherein a transducer of the at least one transducer is acoustically coupled to the skin via an acoustic waveguide.

24. Apparatus according to claim 23 wherein the acoustic waveguide is an optic fiber.

25. Apparatus according to any of claims 1-24 wherein a light source of the at least one light source is optically coupled to the skin via an optic fiber that transmits light from the light source to the skin.

26. Apparatus according to claim 25 wherein a transducer of the at least one transducer light is acoustically coupled to the skin by the optic fiber.

27. Apparatus according to any of the preceding claims wherein the controller controls the at least one transducer to acoustically image the blood vessel.

28. Apparatus according to any of the preceding claims wherein the controller processes signals generated by the at least one transducer responsive to acoustic energy from the photoacoustic waves to image the blood vessel.

29. Apparatus according to claim 28 wherein at least some of the light provided by the light provider is light at a wavelength at which light is strongly absorbed and or scattered by blood.

30. Apparatus according to any of claims 27- 29 wherein the controller uses the image to determine if the blood vessel is substantially aligned with the central region of the field of view.

31. Apparatus according to claim 30 wherein the apparatus comprises an indicator light and the controller controls the indicator light to generate an optical signal indicative of a degree to which the blood vessel is aligned with the central region.

32. Apparatus according to claim 30 or claim 31 wherein the apparatus comprises a speaker and the controller controls the speaker to generate an audio signal indicative of a degree to which the blood vessel is aligned with the central region.

33. Apparatus according to any of claims 27-32 wherein the apparatus comprises a display screen and the controller displays a fiducial mark representing the central region of the field of view and the image of the blood vessel on the screen and wherein a distance on the screen between the blood vessel and the fiducial mark represents a distance between the blood vessel and the central region.

34. Apparatus according to any of the preceding claims wherein the light provider and at least one transducer are comprised in a wearable housing.

35. Apparatus according to claim 34 wherein when worn by the patient the housing provides optical and acoustic coupling of the light provider and at least one transducer respectively to the patient's skin.

36. Apparatus according to any of the preceding claims wherein the analyte is glucose.

37. Apparatus for controlling blood glucose level in a patient comprising:

assay apparatus according to claim 36;

an insulin delivery system controllable to administer insulin to a patient;

wherein the controller controls the insulin delivery system responsive to glucose assays provided by the assay apparatus.